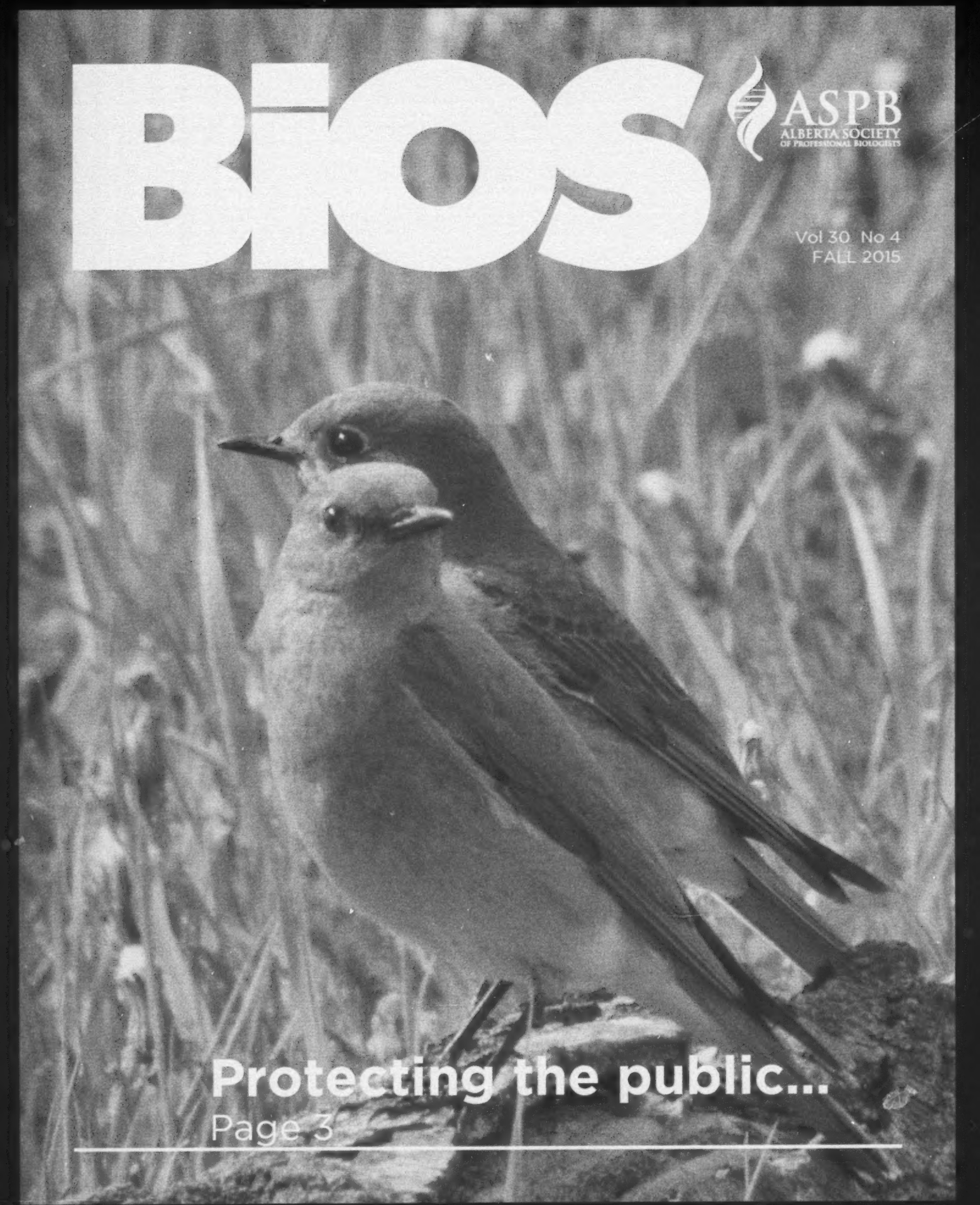
BIOS

ASPB
ALBERTA SOCIETY OF PROFESSIONAL BIOLOGISTS

Vol 30 No 4
FALL 2015



Protecting the public...

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BIOS

is published quarterly by the Alberta Society of Professional Biologists for the benefit of its members and for those interested in the field of professional biology.

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Articles or comments are welcomed and should be sent to announcements@aspb.ab.ca

Cover Photo: Mountain bluebirds at Buck Lake, by Danica Staudt, P. Biol.

...notes from the E.D.

We are already getting pretty excited about the 2016 ASPB Conference. The committee has chosen a very timely theme (**Turning uncertainty into opportunity: Science and regulation in changing times**) and we will explore how poor economic conditions can give rise to unique pressures and emergent opportunities for biologists. The conference runs April 5 - 6 next spring, and will be held at the Carriage House Inn in Calgary. And of course, we are pleased to present the conference poster on the back cover of this issue!

The Conference Committee can really use some help from ASPB Member volunteers. The committee will develop the program for the conference, including drafting the program to ensure the event is engaging, informative, and interesting through the choice of presentations. Please check out the Volunteer section of the website for more information or to apply.

Both the Edmonton and Calgary Professional Development Committees have been doing some stellar work to create PD opportunities for our members. I urge our members to regularly check the Events section of the website to see what is available near you. As a service to members who may not be able to travel to some of our "brown bag luncheon" sessions, most will be available by webinar.

The Society's remarkable growth has meant that I have been focussed on assessing the staffing requirements of the Society, as well as working with the ASPB Board of Directors as it assesses and responds to input gathered from the Society's "owners": Members, the Public, and Government. Updates will be provided to the membership through *BIOS* and the E-news Monthly.

I would like to call the particular attention of our readers to important articles in this issue by our Society's Registrar, Sheila Leggett, and by ASPB President Shaun Toner, as they address the challenges inherent in adjusting to our new membership categories. Also of interest to biologists will be a new regular feature in BIOS: "Our Members Publish". It is gratifying to see how many ASPB professionals are publishing important and interesting articles and papers!

These are indeed challenging - and exciting - times at the ASPB!

Jennifer Sipkens, ASPB Executive Director

Sign up for the ASPB Mentoring Program

To support and encourage the professional development of its members, the ASPB mentoring program offers an opportunity for cross-fertilization of professional expertise and ideas among ASPB members. The program structure is based on a one-year commitment for mentors (experienced and knowledgeable biologists) and protégés (individuals willing to learn from a more experienced professional). Experienced professionals share their knowledge and experience with novice and new members while the new members share their knowledge and new findings with mentors to improve professional practice.

Registration in the ASPB Mentoring Program takes place between January 1st and February 28th each year, coinciding with the ASPB membership renewal period. Please visit the ASPB website for more details.

Protecting the public requires careful introspection and diligence

by Shaun Toner, P. Biol., ASPB President

In light of increasing media and public scrutiny of environmental issues, and in some cases more stringent regulatory signoff requirements, the Alberta Society of Professional Biologists must continue its lead role in regulating professional biologists in Alberta to protect the public. This must be done through maintaining high levels of competence and ethics.

I would like to provide BIOS readers with some perspective on how the ASPB and its Board of Directors, Executive Director, Registrar and the Registration Committee are working together to review and streamline the registration process, in line with our regulatory obligations. Given the changing focus of university degrees to more applied aspects of biological sciences (such as natural resource management and environmental sciences) and the increased need for professional biologists in Alberta's major industries, the ASPB must continuously review registration practices to allow for competent applicants to be accepted under the appropriate membership category.

Diligent reflection on the Society's mandate is an established and specific role of the Board of Directors. This, in fact, is no easy task even if it may seem so at first glance. Fundamental questions are being raised, such as: "what is biology?", "who are biologists?", "who are the stakeholders of the ASPB?" and "what educational and experience requirements must be met to be considered a professional biologist?". Through careful thought and some debate, the answers to these questions are becoming more clear, helping to set direction for the Society.

The ASPB provides a mechanism through which the public of Alberta is assured of the highest possible standards in the practice of biology. For its part, the Alberta Government recognizes the need to safeguard the public interest for various professions, and therefore regulates Professional biologists under the Professional and Occupational Associations Registration Act (POARA) with the aim of protecting the public. Similarly, engineers and geoscientists are regulated under Engineering and Geoscience Professions Act (EGPA) and the professional agrologists are regulated under the Agrology Profession Act (APA). As with POARA, the intent of the EGPA and APA is to protect the public of Alberta by regulating various aspects of each profession so that tasks are performed ethically by qualified and competent individuals.

In recent years, the Alberta Government has instituted a number of policies and codes of practice requiring that qualified specialists sign-off on various technical documents. Currently, biologists must be regulated in order to sign off on Upstream Oil and Gas Reclamation / Remediation Practices. As well, Alberta Environment and Parks is looking to have only regulated professionals sign off on Wetland assessments and/or replacement designs.

This all means the ASPB must ensure our professionals are competent and meet the appropriate standards of entry to our organization so they can sign off on these government-required documents. The ASPB recognizes that the breadth of education and experience may need to be broadened to meet the intent of POARA and the Professional Biologist Regulation, to ensure that competent applicants can be accepted into the Society to fulfil the mandate of protecting the public of Alberta.

By no means is this meant to dilute the standards to which the ASPB or its members must adhere when practicing biology in Alberta. The Board, Executive Director, Registrar and Registration Committee are committed to continually reviewing registration practices so that the ASPB remains an inclusive organization within its regulatory obligations. The ASPB will continue to adjust registration practices to accept competent applicants in accordance with POARA and the Professional Biologist Regulation. This must be done to satisfy the Alberta Government's mandate to protect the public, by setting standards for the practice of biology and regulating our members accordingly.

This is an important and rather complex period at the ASPB. Through careful introspection and diligent attention to detail, we will be better-equipped to serve both the public and our members. Bear with us as the Board of Directors and Registration Committee work with the Registrar and Executive Director to move this important agenda forward!

A reminder about membership renewals

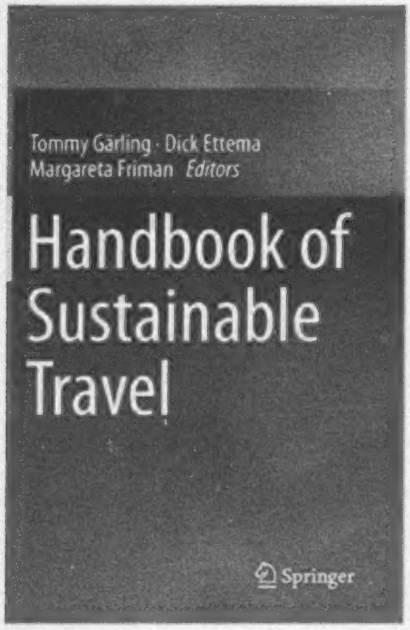
The Alberta Society of Professional Biologists' membership year runs from January 1 to December 31. You will receive notices via email when it's time to renew your membership, but it is important to keep your contact information current so you will receive the notices. You can do this by logging into your member account on the ASPB website.

It may seem like a long way off, but time can slither by quickly when you are busy: please remember that if you do not renew your membership in a timely fashion, you will be removed from the register, and you will need to reapply to the ASPB.

Book Review

Handbook of Sustainable Travel

Reviewed by Saikat Kumar Basu



Travel is a part of our culture of which we are all very proud. Travel provides us with the opportunity to face unknown challenges, enjoy new excitements and most importantly helps us transform into global individuals by breaking down inherited stereotypes. It is a great way to get to know this planet we all share, enriching our understanding of varied environments and different societies, cultures and people far more intimately than just peeping through the doors of libraries, surfing the internet or watching documentaries.

But did we ever think about how our travel habits and practices are changing and shaping this world for better - or worse? Did we know that the positive and negative impacts of our travel across the planet have been documented by prominent researchers? This volume is a timely and exciting production which captures the multi-dimensional aspects of travel and their impact on the environment and our lives. There is comprehensive coverage about different environmental and sociological impacts of travel and transport, along with research on customer services and the related aspects of behavioral sciences and population studies, transport geography, psychology, economics, engineering, planning, and management.

The volume is a collection of 20 articles arranged in four different sections, each reviewing travel from a unique perspective, described as follows:

Section I: Overview covers the introduction, historical facts, travel and society, traveller's perspectives and future trends of the travel industry;

Section II: Car Use covers the impact of different cars and related vehicles and how they have occupied a prominent position as the principal mode of transportation for this industry, along with a future-trend analysis;

Section III: Travel and Social Sustainability highlights responsible travel practices with a focus on sustainability, social cost-benefit analysis, health, and business-related travel from an environmental, economic and sociological perspective;

Section IV: Sustainable Travel explores future alternatives for sustainable travel through using public transport systems and the adoption of non-motorized transportation. This section also looks at future possibilities, challenges and opportunities.

Readers will be fascinated to learn about the positive and negative impacts of our travel habits and practices around the planet and how they impact the economy as well as local ecosystems and the environment at large. They will also learn about the distinction between sustainable travel practices and the challenges of eco-travelling and ecotourism, and how that is integrated with different societies and cultures across the planet. There is fascinating information about modifying our travel practices for the purpose of long term sustainability, and learning about how we might restrict our activities to reduce anthropogenic impacts so they stay within the carrying capacity of specific localities and/or environments.

The language used throughout is straightforward and accessible for non-technical readers. The use of diagrams, images, tables and figures further simplifies different objectives, concepts and proposals into layman's terms, making it comprehensive yet easily digestible for all. Several chapters deal with the concept of sustainable travel from the destination perspective: how societies could look into ways of promoting sustainable travel habits and practices, affording readers an understanding of a simpler and more holistic view of life and how that can transform complex situations into better opportunities with a long term sustainable future. There are innovative ideas and observations from the different authors, and their philosophies regarding sustainable travel practices (including proposals of how to reduce carbon footprints and several related anthropogenic pressures).

The editors should be congratulated for the brilliant breakdown of the book's contents into meaningful sub-sections, and for the useful linkages maintained between different sections. The entire volume makes for a coherent read, with each part picking up the story and moving it forward. The helpful index at the end of the volume (and the bibliographies provided with individual articles) will help serious readers and researchers explore beyond the scope of the volume.

I expect this volume may become a priceless collector's item for people who enjoy traveling and who share an interest in the impacts of such activities at a global level, as well as how they might modify their behavior for positive end results through life style changes and responsible behavior.

Handbook of Sustainable Travel by Gärling, Tommy, Ettema, Dick, Friman, Margareta (Editors); 2014, XVI, 341 p. 28 illus., 7 illus. in color; eBook: ISBN 978-94-007-7034-8; Price: $99.00; Hardcover: ISBN 978-94-007-7033-1; Price: $129.00

From the Registrar's desk

Sheila Leggett, P. Biol.

It is a privilege to serve as the Registrar of ASPB. I joined the organization when it was just beginning in the early 1980's. From those early days when the registration began with membership number 001, we now have over 1700 members.

Much has changed since the early days of the formation of the Society. The practice of biology has evolved and changed. Practice areas like synthetic biology have emerged and there has been an evolution of the applied practice of biology. An example of evolution has been in the myriad of practice areas and academic programs under the general category of environmental biology. Many university programs have developed within applied fields of biology such as impact assessment, reclamation and remediation, and more. This has created challenges for the Society, especially for the Practice Review Committee and the Registration Committee, and important questions arise such as "what is the definition of the practice of biology" and "what academic credentials should be counted when assessing whether an applicant should be granted designation as a BIT, P. Biol., R. Biol. or R.T.Biol."

In the early days of ASPB, it was my experience that biologists working within the oil and gas industry were not regarded as "professionals". I recall joining an international company where a dilemma for the human resources group was whether I should attend the orientation session for the technologists or for the engineers. (They decided that with my background - an undergraduate degree in biology, some field research and lab experience and a couple of publications - I would fit better with the technologists!)

I suggest to you that my experience was not uncommon. It was difficult for leadership teams to imagine what biologists might meaningfully bring to the table of a company involved with oil and gas production. Fast-forward to 2015, and many companies and government bodies now require a professional designation, like a P. Biol., as one of the criteria for potential employment.

What does this change in demand for our professional expertise mean to the ASPB? It means our organization has an important role in regulating the work that each of us does. This presents new opportunities for the organization to continuously improve our regulatory frameworks, both in terms of clear requirements for membership in ASPB and continuing competence and discipline requirements.

Stay tuned for updates through this column.

Member survey on technologist issues generates interesting viewpoints

by Peter G. Kingsmill

During the month of August, the Alberta Society of Professional Biologists conducted a survey to get feedback on how ASPB Members felt about the potential for biological technologists to become professional biologists with P. Biol. designation. There have been questions raised about the potential for highly respected technologists with over 20 years of experience to successfully apply to become a professional member, versus the more likely scenario that technologists would still need to complete a degree to receive P. Biol. designation.

Some ten percent of the Society's members responded to the survey, and while the tone of the responses generally reflected the approval rate for bringing biological technologists into membership that was expressed through voting on the issue at the 2014 Annual General Meeting, a number of responses demonstrated that there remains a lot of misinformation about the implications - and processes - going forward.

Fundamentally, biological technologists are being added as a membership category because the work they do provides information to professional biologists to use in the performance of their job. As such, it is important that they too are regulated - and subject to continuing competency and discipline - in order to protect the public interest. As ASPB Executive Director Jennifer Sipkens notes, "The ASPB is emphatically not merely an association of like-minded biologists - in effect, a 'club'. The Society is a regulatory body mandated by the Alberta Government to regulate the practice of biology; being more inclusive and allowing biological technologists into the ASPB helps fulfill that mandate."

Of course, including technologists will have a significant impact on the operations of the ASPB. Growth in membership numbers and regulatory complexity will be inevitable. One respondent expressed a concern about the Society's capacity to handle this growth, and a couple suggested it seemed like an ASPB "money grab".

Continued on Page 6

Member survey on technologist issues... continued from page 5

Ms. Sipkens acknowledges that - far from being a "money grab" it will require a considerable investment in managerial capacity to carry this initiative forward: "It will be up to the ASPB's management to ensure that the mandate of the Society is followed; we are establishing management structures which will give us the capacity to process new applications and handle discipline matters as they arise. One of these structures has been the move to Policy Governance, under which management is now empowered to make specified decisions to better manage the Society, while the board is better equipped to guide the direction of ASPB."

Other survey respondents pointed out that it may take some time to educate the public on the difference between a P. Biol. and a Registered Technologist in Biology: "Other professions already have two streams of membership so this only mirrors what other professions have; (however) techs should be with the biology association in the province and be regulated alongside other professionals in the same field." And, of course, when it comes to clients' decisions to hire a technologist versus a P. Biol., the ASPB is not in the business of determining the job market; companies will hire whoever they feel can best do the job. The work of technologists and the work of P. Biol.s are inherently different, so although there may be some overlap, that is likely happening already.

Along the same line, another survey respondent commented as follows: "It is necessary to advance the way in which society views the role of biological professionals. If we fight this, it will only cause division. As biological professionals we need to be united in the cause of promoting the practice of biology by accredited professionals and recognition of such by the public, versus the current situation where any individual, regardless of education and experience, can advise and make public comment on biological issues with few or no repercussions for bad practice."

Moreover, the Alberta Government has clearly said there cannot be a separate scope of work for P. Biol.s and technologists (the Professional Foresters do not have this either). Ms. Sipkens points out, "we are here to regulate all biologists for public protection. We don't have mandatory registration, and restricted scope is not allowed for under Alberta's Professional and Occupational Associations Registration Act. We are happy to see that both technologists and P. Biol.s are joining the Society voluntarily. The P. Biol. designation is not a brand (or a marketing gimmick to generate more work for members). It is purely an official recognition that you are regulated, subject to continuing competency and discipline procedures, and have met the minimum standards for entry into the regulatory body."

When considering specifically the issue of transitioning from technologist to P. Biol. designation after 20-plus years of practice, more than one respondent commented that a person's title or level of education does not mark their ability. However, while a number suggested that experience and competence should be factored in, just as many felt a technologist should have a university degree.

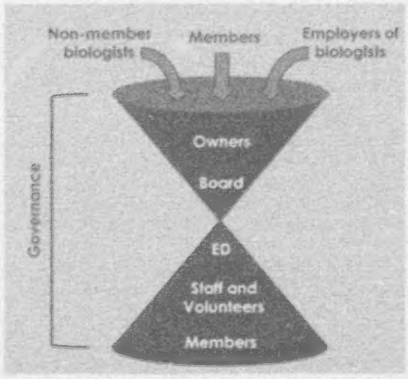
Again, Ms. Sipkens affirms that "we are not looking to 'capture exceptional technologists' with this designation; our job is to regulate all biologists. Technologists play an important role in the work done in Alberta, so they too should be regulated."

The ASPB will continue to engage the membership on these and other issues as the process of fulfilling its mandate moves forward. Stay tuned!

It is time to get your voice heard

by Karoliina Munter, P. Biol.

The ASPB Board of Directors is reaching out to three distinct owner groups this fall to get input on important questions: members, non-member biologists, and employers of biologists. We have developed a brief online survey and will begin to collect responses which will be distributed early this fall. The survey responses will be taken into account when the board plans the future direction of ASPB. As a board, we take the owners' values and wishes and translate these into organizational goals, which are the guiding targets for our Executive Director and staff.



Who are owners? Owners are those people that the organization owes its existence to. ASPB's moral owners are the public of Alberta because the legislation that gives the ASPB the power authority to govern professional biologists is based on public protection. Our organization's legal owners are ASPB members because the membership holds the power to elect the board. *"Governance exists in order to translate the wishes of an organization's owners into organizational performance." (John Carver).*

Microbiology Practice Area Steering Committee

by Dr. Markus N. Thormann

Markus Thormann

Hello, fellow microbiologists! As you may have heard through the mycelium, the Alberta Society of Professional Biologists now has a Microbiology Practice Area Steering Committee (MPASC), which was formed in late 2014/early 2015.

To be more inclusive, "microbiologists" (sensu lato) work in various biological disciplines, including microbiology, mycology, virology, parasitology, cytology, cell biology, biochemistry, genetics, physiology, taxonomy, and related disciplines. Our work may be multi-disciplinary in nature and expand into the realm of traditional ecology (e.g. bioremediation, plant/animal pathology, or microbial community analyses/dynamics) yet few of us are recognized as "true biologists".

The role of the MPASC is to coordinate activities for practitioners in this practice area on behalf of the membership, with our goals being to:

- provide a forum for microbiologists in the ASPB to network and discuss issues affecting the profession;
- provide a forum for microbiologists in the ASPB to share and collect knowledge (research papers, etc.);
- provide resources for practitioners, such as links to important organizations and to regulatory documents;
- identify to the board where new policies and guidelines contradict the ASBP Code of Ethics;
- provide higher level professional development opportunities for microbiologists outside those offered by the Professional Development Committees; and
- engage existing microbiologists to get involved in the ASPB, and to attract new members to the ASPB.

As is, we are still looking for a Steering Committee member in the health sciences or medical microbiology sectors. If this is you, please contact me at markus.thormann@advisian.com. Going forward, you will see a few articles in BIOS about the work we do in an effort to highlighting our work and the roles we play in the everyday biological world.

Dr. Markus N. Thormann is a classically-trained mycologist and the Chair of the Microbiology Practice Area Steering Committee. He works as an environmental consultant for WorleyParsons in Edmonton, where he manages the environmental sciences team of the newly-formed Advisian Environment & Society services business line, and he also operates his own consulting firm, Aquilon Services Ltd.

Consultation document:

Standard for Vegetation Surveying

A group of biologists in Alberta has been trying to address problems associated with vegetation surveying. The biologists believe that data collected for environmental assessments can be inadequate and that biodiversity is being lost in the Province without ever being recorded.

The group proposes a standardized approach to vegetation surveying and releasing a minimum set of data into the public domain. The group also proposes surveyors take responsibility for the data collected which would make the standard self-regulating. You are invited to read this proposed standard and offer comments, support and criticism.

The current document is available at http://www.seriousaboutscience.org/standard . It will be updated monthly based on feedback received and the final document will be published at the end of October 2015.

Great horned owl, taken by ASPB Student Member Heather Polan.

Our Members Publish

BIOS is pleased to include information about professional and technical publications by our members, who may provide us with the author(s) name(s), title, date published and availability (where published, and an internet link if it is available online). The bibliography will reflect material published within the 12 month period preceding the current BIOS edition.

The following publications have been submitted by ASPB Members; the name of the Member submitting the information is bolded.

Boulanger, J. and **G. B. Stenhouse**. 2014. The impact of roads on the demography of grizzly bears in Alberta. PloS one 9:e115535.

Bourbonnais, M. L., T. A. Nelson, M. R. L. Cattet, C. T. Darimont, **G. B. Stenhouse** and D. M. Janz. 2014. Environmental factors and habitat use influence body condition of individuals in a species at risk , the grizzly bear. Conservation Physiology 2:1–14.

Cattet, M., B. J. Macbeth, D. M. Janz, A. Zedrosser, J. E. Swenson, M. Dumond, and **G,B. Stenhouse** 2014. Quantifying long-term stress in brown bears with the hair cortisol concentration : a biomarker that may be confounded by rapid changes in response to capture and handling. Conservation Physiology 2:1–15.

Coogan, S. C. P., D. Raubenheimer, **G. B. Stenhouse** and S. E. Nielsen. 2014. Macronutrient optimization and seasonal diet mixing in a large omnivore, the grizzly bear: a geometric analysis. PloS one 9:e97968.

Cristescu, B., **G. B. Stenhouse** and M. S. Boyce. 2014. Grizzly bear ungulate consumption and the relevance of prey size to caching and meat sharing. Animal Behaviour 92:133–142. Elsevier Ltd.

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Pigeon, K. E., S. E. Nielsen, **G. B. Stenhouse** and S. D. Côté. 2014. Den selection by grizzly bears on a managed landscape. Journal of Mammalogy 95:559–571.

Roberts, D. R., S. E. Nielsen and **G. B. Stenhouse**. 2014. Idiosyncratic responses of grizzly bear habitat to climate change based on projected food resource changes. Ecological applications 24:1144–1154.

Shafer, A. B. a, S. E. Nielsen, J. M. Northrup and **G. B. Stenhouse**. 2014. Linking genotype, ecotype, and phenotype in an intensively managed large carnivore. Evolutionary applications 7:301–12.

Vartanian, M., W. Nijland, N. C. Coops, C. Bater, M. A. Wulder and **G. Stenhouse**. 2014. Assessing the impact of field of view on monitoring understory and overstory phenology using digital repeat photography. Canadian Journal of Remote Sensing 40:85–91.

White, C. F. H., N. C. Coops, W. Nijland, T. Hilker, T. A. Nelson, M. A. Wulder, **G.B. Stenhouse**. 2014. Characterizing a Decade of Disturbance Events Using Landsat and MODIS Satellite Imagery in Western Alberta, Canada for Grizzly Bear Management. Canadian Journal of Remote Sensing 40:336–347.

Wilson, R., H. Jones-Otazo, S. Petrovic, M. Roushorne, L. Smith-Munoz, D.Williams and **I. Mitchell**. 2015. Estimation of sediment ingestion rates based on hand-to-mouth contact and incidental surface water ingestion. Human and Ecological Risk Assessment 21(6): 1700-1713. DOI: 10.1080/1080739.2014.974498. (http://www.tandfonline.com/doi/abs/10.1080/10807039.2014.974498#.Ve8iFZfiOB0)

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Hamilton, L. (2015) Rare Plant Distribution Modelling: Exploring Predictor Datasets – A Case Study in Southeast Alberta. University of Calgary http://theses.ucalgary.ca/handle/11023/2128

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Leech, R. 2014. Binoculars, Part II: Prisms, Holding Steady. October 2014, CHAS News. 2 pp. (contact author at releech@telus.net)

Leech, R. 2014. More About Binoculars, Part III. Terms/Definitions/Glossary (3 p.) and Part IV, Field of View, 3 pp. Publ. CHAS NEWS November 2014. (contact author at releech@telus.net)

Leech, R. 2014. Age vs Dilated Pupil Size: Factors to Consider Regarding Your Eyes and Binoculars used for Biological Research, Birding and Hunting. Alberta Hunter Education & Instructors' Association. Conservation Education Magazine, Fall 2014. Pp. 22-23, 3 figs. (contact author at releech@telus.net)

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A passionate young biologist shares her story

The following letter first appeared in the Alberta Society of Professional Biologists' student newsletter BIOTA, in August 2015:

Dear students:

In case my story may be helpful to some of you, I want to share my experience about how I came to work as a biologist and the role the ASPB played in developing my career.

I completed a Bachelor degree in Biological Science in 2010 at the University of Calgary. During my last two years of school, I visited my guidance counsellors, hoping to receive some direction and a list of potential career options, but I often left those meetings feeling even more confused than I had felt going into them. I tried not to worry about it, and just focused on my studies.

Connect with people!

Before too long, I was attending my convocation and still had no real plans for life after school. I was fortunate, however, to have a contact working in the oil and gas sector, who offered to distribute my resumé to several of his own contacts at various consulting companies in Calgary.

At the time, I didn't have a good grasp of what consultants really did on a day-to-day basis. Feeling rather naive, I attended my first interview and was offered a position at the same consulting company where I still work today. Hearing how difficult it was for some of my friends to acquire jobs after graduation really put things into perspective for me: connections are important!

Become a Professional!

Within a few months of starting work, my manager suggested I apply for Biologist-in-Training (BIT) status with the ASPB. After three years as a BIT, I was then eligible to obtain my Professional Biologist (P. Biol.) status and stamp, which meant I received sign-off authority on reports. (These days) sign-off authority is critical for career advancement, so I didn't hesitate!

Get involved!

My manager also suggested that I volunteer with the ASPB, which was one of the best pieces of advice I've received in my career to date. I have been volunteering for four years now, and during those four years, I was able to meet many other biologists and related practitioners in consulting, government, industry and academia. Having a network of colleagues and friends I can rely on for technical advice and mentorship has really opened doors for me. Having that network has also helped me through some challenging moments!

If for no other reason than to meet practicing biologists and seek advice, I would highly recommend that students become ASPB members and attend some of the Society's events. I am certain you will find it invaluable; I know I have!

Wishing all students the best of luck,

Aynsley Shirriff, B.Sc., P. Biol.

Think about the ASPB Publication Awards

by Dave Ealey, P. Biol., ASPB Awards Chair

It is indeed gratifying to see that Alberta biologists are being so productive in the publishing department. I read (see Our Members Publish, this issue) that there are well over 30 important papers listed, and I am sure there are more - this listing of current publications is a new feature in BIOS.

So, it is timely to remind our members of the Peggy Thompson Publication Awards, and suggest they consider nominating one or more of these papers for this prestigious recognition. (ASPB Members can even nominate their own published material.) All ASPB members are eligible (except of course the Members of the Awards Selection Committee!).

You have some time (the deadline for us to receive nominations is in February) but don't put it off! For more information and a nomination form, you can go to the ASPB website at https://www.aspb.ab.ca/scholarships-and-awards.

Fungi in Peatlands – Diversity and Functions

By Dr. Markus Thormann

Years ago, I was asked how many fungi occur in Alberta. While we have a pretty good understanding of the species richnesses of vascular and non-vascular plants, mammals, birds, etc. at the provincial level, there is a paucity of data on the fungal species richness not just at the provincial level, but also at the regional and local levels...in fact even at the levels of spatially-restricted ecosystems and specific substrata, such as leaves, roots, stems, decomposing matter, and soils. At the smallest scales, the answer to the species richness question may be from a dozen to hundreds of fungal taxa, at larger scales, the answer may be from several thousands to hundreds of thousands of fungal taxa.

Yes, fungi are almost everywhere, and we have encounters with them all of our lives. We have eaten them (e.g. Penicillium roquefortii in blue cheese or Agaricus bisporus (button mushrooms)) and drunk them (e.g. Saccharomyces carlsbergensis in many beers). They may have saved our lives (e.g. via penicillin produced by some Penicillium spp.), challenged our health (e.g. athlete's foot caused by some Trichophyton spp.), or caused the death of one of our backyard plants (e.g. Armillaria mellea causing butt rot of some trees). Some are remarkable (e.g. back to A. mellea, the honey mushroom, which is edible, a plant pathogen, bioluminescent, mycorrhizal with some orchids, and the largest organism on Earth), while others are not (e.g. little brown mushrooms (LBMs) that show up in forests and your backyards and are notoriously challenging to identify). Despite their prevalence almost everywhere, we still know relatively little about them, with perhaps only 10% of all fungi having been described globally to date.

Here, I want to raise some awareness of fungi in peatlands, which has occupied my life for the past 20 years. I won't make this article über-technical, you can always Google Scholar™ some of my (and my colleagues') papers for additional information, but I want to address some of the roles that fungi play in peatlands. First off, well over 600 fungal taxa have been reported from peatlands globally, with more being described and discovered annually. Most of the fungi belong to the Ascomycota (include most molds and the edible morels) and Basidiomycota (include your showy mushrooms or toadstools, whatever you want to call them), the two largest divisions of fungi, and fewer taxa belong to the Zygomycota (which include many of your bread molds) and Chytridiomycota (mostly microscopic plant parasitic taxa). Overall, the five most common genera in each of these four fungal divisions account for about 40% of all fungi known from peatlands. From a functional perspective, fungi have several critical roles. Let's have a closer look at them as saprobes and mycorrhizal fungi.

Fungi play fundamental roles in the decomposition processes of organic matter in all ecosystems and may be more important than bacteria (sensu lato) in wetlands, because of their extensive hyphal growth habit, faster growth rates, and ability to translocate nutrients through their hyphal network. In their role as decomposers (saprobes), fungi have differing abilities to decompose organic matter, ranging from being pathogens or only weakly parasitic (able to degrade simple sugars and other storage compounds, poor competitors) to being pioneer saprobes (able to degrade simple sugars and other storage compounds, excellent competitors), simple polymer degraders (able to degrade structural polymers, including cellulose, pectin, and hemicelluloses), recalcitrant polymer degraders (able to degrade complex polymers, including lignin, tannins, and other polyphenolics), or secondary saprobes (opportunistic and commensal taxa). The majority of fungi likely specialize in one or two of these ability categories, but none are good at all five categories. Hence, as organic matter decomposes, the fungal communities of the organic matter change in response to changes in the quality of the remaining organic matter, i.e. as organic matter decomposes, there are taxonomic and functional succession dynamics at play from a mycological perspective.

Coral fungus (Ramaria sp.) photo by Markus Thormann in central Germany, 2011.

For example, from a functional succession perspective, lignin, holocellulose, and cellulose are the dominant structural polymers in plant tissues (>80% of all carbon polymers). The decomposition of these macromolecules by fungi is accomplished via the synthesis of a diverse suite of extracellular enzymes, including cellulases, polyphenol oxidases, pectinases, and amylases, among others. Many fungi have the ability to degrade simple molecules (functional redundancy), including starch; however, their ability to degrade complex structural polymers (e.g. cutin, suberin, "Klason lignin", true lignin, and tannins) is limited and has most often been ascribed to basidiomycetes and some

ascomcyetes. As organic matter decomposes, desirable nutrients, such as N, P, amino acids, and simple sugars, become scarcer, while more complex structural polymers, such as lignin and lignocellulose, increase proportionally in the litter. Because these structurally more complex polymers are harder to decompose by fungi and bacteria, they tend to accumulate in ecosystems, which, contributes to the accumulation of organic soil (peat) in peatlands.

Taxonomic succession of fungi during the process of decomposition has been observed in a variety of plant species in terrestrial and wetland ecosystems. This succession of saprobic fungi results in the decomposition of the substrate and may be due to the process of facilitation, where species of a particular behavioural group alter the substrate sufficiently to allow other species to become established and form a subsequent community. Overall, it has been shown that the quality of the organic matter appears to have a more profound impact on the decomposer community than environmental conditions, including pH or temperature. So, yes, some fungi may be carbon limited even though they are surrounded by carbon in the form of peat in peatlands, and if I were an intelligent fungus, I might have to paraphrase Samuel Taylor Coleridge and say "carbon, carbon everywhere, nor a simple sugar to decompose" (paraphrased from Rime of the Ancient Mariner).

Another critical role fungi perform in peatlands centres on their relationship with many plants, e.g. trees, shrubs, and most herbs and graminoids. These fungi are termed mycorrhizal fungi. Mycorrhizas are mostly mutualistic associations between fungi and the roots of higher plants, in which the fungi form consistently recognizable and physically distinct associations without causing any perceivable negative effect. It is thought that in excess of 90% of all terrestrial plants are mycorrhizal, irrespective of environmental conditions, climate, ecosystem, soil type, and vegetation communities. There are five common types of mycorrhizas: ectomycorrhizas, vesicular-arbuscular mycorrhizas, ericoid mycorrhizas, arbutoid mycorrhizas, and orchid mycorrhizas - the former three being by far the most dominant ones in most ecosystems, including peatlands. The widespread occurrence of mycorrhizas suggests that they play ecologically significant roles, including the acquisition, storage, and translocation of nutrients. For example, host plants frequently have

Peat core, photo Markus Thormann in a fen just south of the Town of Athabasca (AB) 2009.

elevated tissue concentrations of N and P, show reduced wilting due to water stress or high salinity, and have higher water-uptake rates than non-mycorrhizal plants (there may be applications in reclamation efforts!). As such, these fungi facilitate the establishment and proliferation of many plants in peatlands, which many regard as harsh ecosystems by virtue of their often low pH and low nutrient availability. As an added bonus, many mycorrhizal fungi have the ability to decompose some organic matter, thereby performing a dual role in peatlands.

Aside from these two major roles, some fungi also form lichens with specific algae and bacteria, which can serve as food sources to some wildlife species. In addition, several peatland fungi are choice edibles for humans, e.g. Cortinarius caperatus, the gypsy mushroom, while others are pathogens that affect both vascular and non-vascular plant species.

Clearly, with fungi being ubiquitous and performing many critical roles in peatlands, there is a need to shine a light onto these often-appreciated organisms. Along with bacteria (sensu lato) and insects, fungi significantly contribute to the overall biodiversity of virtually all ecosystems and are critical components of virtually all biogeochemial processes, including nutrient and carbon cycling. I challenge all of you to keep an eye open for fungi on your next field trip or walk in the favorite neck of the woods. I can almost guarantee you that you will see them everywhere you go, and that your focus will shift just a bit from forward to more downwards, where the wondrous world of fungi begins.

Dr. Markus Thormann has been a P. Biol. since 2008 and was a member of the Board of Directors from 2010-2012. More recently, he participated in the Wetlands Practice Area Steering Committee and currently chairs the newly-formed Microbiology Practice Area Steering Committee. Over the past 20 years, he has been involved in extensive wetland ecological and mycological research and continues to collaborate with mycologists in western Siberia, Russia, to gain a better understanding of the diversity and roles of fungi in northern peatlands. He works as an environmental consultant for WorleyParsons in Edmonton, where he manages the environmental sciences team of the newly-formed Advisian Environment & Society services business line, and he also operates his own consulting firm, Aquilon Services Ltd.

2016 ASPB CONFERENCE

ASPB
ALBERTA SOCIETY
OF PROFESSIONAL BIOLOGISTS

Turning Uncertainty into Opportunity

Science and regulation in changing times

April 5 - 6, 2016

The Carriage House Inn, Calgary

The theme for the 2016 Alberta Society of Professional Biologists' conference, "Turning uncertainty into opportunity: Science and regulation in changing times," will explore how poor economic conditions can give rise to unique pressures and emergent opportunities for professional biologists, and will additionally illuminate the potential repercussions of our economy on the regulatory environment in which we work. Topics will include:

- During challenging economic times, what is our role in balancing the need for sound science while safeguarding the public interest?
- What is the business case for monitoring natural resources (e.g. species at risk) during an economic downturn?
- How do recent regulatory changes affect our practice?

For more information and to register, go to www.aspb.ab.ca/conference

The Alberta Society of Professional Biologists (ASPB) is a professional regulatory body that is committed to the promotion of excellence in the practice of biology.

PHOTOGRAPHY BY BOB COOK